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TECHNICAL MEMORANDUM

Date:	October 13, 2015
Prepared for:	Central Valley Regional Water Quality Control Board
On behalf of	Port of Stockton
Prepared by:	Paul Bedore, M.S.
Reviewed by:	Michelle Brown, P.E.
Subject:	Methylmercury Control Study Progress Report

Introduction

The Port of Stockton (Port) has been characterized as a medium-size Phase I Municipal Separate Storm Sewer System (MS4) and is regulated under Central Valley Regional Water Quality Control Board (Central Valley Water Board) Waste Discharge Requirements Order No. R5-2011-0005 (National Pollutant Discharge Elimination System (NPDES) Permit No. CAS0084077 (Permit)).

The Port has been named as an urban runoff point-source discharger in the Delta Methylmercury Total Maximum Daily Load (TMDL). Because of this designation, the Port's Permit contains requirements to address the Port's contribution to the mercury impairment of the Delta by implementing a Total Mercury and Methylmercury Control Program. The Total Mercury and Methylmercury Control Program requires that methylmercury control studies be conducted to monitor and evaluate the effectiveness of existing BMPs on the control of methylmercury, and to develop and evaluate additional BMPs as needed to reduce the mercury and methylmercury discharges to the Delta. The Port's Methylmercury Control Study Work Plan (Work Plan) was approved by the Executive Officer of the Central Valley Water Board on February 14, 2014. This Progress Report provides a summary of the current status of the Port's methylmercury loads and Work Plan activities implemented to date. A final report for the study will be submitted by the Permit-required due date of October 20, 2018.

Current Methylmercury Loads

Analysis of the Port's methylmercury loads to date has shown that the Port's average annual load, based on four-years of data, to the Central Delta subarea is 0.10 g/year and to the San Joaquin River subarea is 0.0033 g/year (**Table 1**). The Port's methylmercury load to the Central Delta subarea is less than the corresponding WLA of 0.39 g/year. For the San Joaquin River subarea, the Work Plan provided a detailed description of inaccuracies in the calculation of the current WLA of 0.0036 g/year. Had the Port's methymerucry WLA to the San Joaquin River subarea been calculated using the correct land area draining to this subarea (495 acres), the WLA would be 0.070 g/year (Table 1). The Port's methylmercury load to the San Joaquin River subarea has been less than the current WLA and much less than the corrected WLA. Detailed analysis of the Port's current methylmercury loads and

compliance with WLAs is available in the Port's Report of Waste Discharge that was submitted to the Central Valley Water Board on August 5, 2015. Based on this assessment, the Port's existing BMPs are effective at maintaining methylmercury loads below applicable WLAs.

Table 1. Comparison of Port of Stockton methylmercury loading estimates to Waste Load Allocations (WLA) for the Central Delta and San Joaquin River subareas in grams per year.

Delta Subarea	Storm Water Year (July 1 – June 30)				4-Year Average	WLA
	2011/2012	2012/2013	2013/2014	2014/2015		
CENTRAL DELTA	0.15	0.11	0.071	0.082	0.10	0.39
SAN JOAQUIN RIVER	0	0.0055	0	0.0076	0.0033	0.0036[a] / 0.070[b]

Notes:
A loading of 0 g/year occurred in years when there was no discharge from the Port's MS4 to the Delta subarea.
[a] The WLA listed here is the value currently listed in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, but this value was calculated using an incorrect area (28 acres) for the sub-watershed draining to the San Joaquin River subarea (correct area is 495 acres).
[b] The WLA value listed here is the corrected WLA value calculated using the correct sub-watershed area draining to the San Joaquin River subarea (495 acres). The calculation followed the approach detailed in Sections 6.2.5 and E.2.3 of the 2010 Staff Report for the Sacramento-San Joaquin Delta Estuary TMDL for Methylmercury, using the following data: San Joaquin River subarea urban land area = 495 acres; annual precipitation = 16.6 in/year; runoff coefficient = 0.7; dry weather runoff rate = 254 gal/acre/day; total number of dry days per year = 305; methylmercury concentration in wet weather runoff = 0.241 ng/L; methylmercury concentration in dry weather runoff = 0.363 ng/L; San Joaquin River subarea % load allocation = 36.1%.

Methylmercury Control Study Progress

Control Study Overview

Methylmercury may be generated in sediment contained in storm drains throughout the Port of Stockton's property. The Port's methylmercury control study assesses the effects of removing sediment from storm drain catch basins on methylmercury generation and accumulation. Storm drain maintenance is on-going throughout Port property. Removal of methylmercury-laden sediment from storm drains could result in decreased loading of methylmercury to the Central Delta and San Joaquin River subareas.

The intent of the Control Study is to address the following objectives and hypotheses.

Objective 1: Determine whether methylmercury accumulates in sediments collected in storm drains.

Hypothesis 1: Storm drain catch basins, and the sediment they accumulate, are suitable environments for methylmercury generation and accumulation. Greater amounts of methylmercury are generated during the warm, summer months prior to evaporation of water from the storm drain catch basin.

Objective 2: Determine the impact of drain maintenance on the accumulation of methylmercury in storm drain sediments.

Hypothesis 2: Removal of sediment from the storm drain catch basins during annual summer maintenance will lower methylmercury concentrations in sediment (contained in the catch basin) from year to year, and thus reduce the likelihood that this methylmercury would be discharged to receiving waters.

The control measure being investigated in this study consists of storm drain maintenance using a sump pump to remove water followed by removal of sediment by shovel or removal of water and sediment simultaneously by vactor. In order to determine the influence of maintenance, a paired and replicated study design was implemented using similar storm drains receiving runoff from identical adjoining land uses, and thus ideally similar pollutant and runoff loads. Thus far, the study has utilized two separate storm drain laterals at "Site A" and "Site B" on the East Complex (**Figure 1**). Two, side-by-side drains were assessed on each of the two sites (two adjacent drains on the drain lateral at each site – an upstream and downstream drain at Site A and an upstream and downstream drain at Site B). At each site, the upstream storm drain was considered the "treatment" drain and was to receive annual maintenance in August, while the downstream storm drain at each site was considered the "control" drain and would not receive annual maintenance.

Figure 1. Image of the Port of Stockton's East Complex showing the locations of the two storm drain laterals (Site A and Site B) monitored for the Methylmercury Control Study.

Control Study Implementation

In accordance with the Work Plan, the sampling stations at Site A and Site B were visited on three separate occasions in 2014. The first event targeted a period in late winter after rainfall had started to occur for the year; the second event targeted the end of the wet season; while the third event targeted sampling of the drain prior to drain maintenance in August. This same sampling schedule was to repeat in 2015. During 2014, the sampling stations were shown to contain water for much of the year, but there was little to no accumulation of sediment, as shown in **Table 1**. Maintenance of the upstream drains in August 2014 was unnecessary because negligible amounts of sediment and/or debris had accumulated in the drains up to that date. In February 2015, the sampling stations again contained water, but little to no sediment had accumulated. Negligible sediment accumulation in these drains was associated with critically dry hydrologic conditions that occurred in the area in both 2014 and 2015, resulting in lower than average storm water runoff. Activities which can be associated with elevated sediment

accumulation in nearby drains, including vehicle traffic and industrial operations, have been lighter in the vicinity of the monitoring stations compared to the past. Based on these observations, the Port requested and received approval from the Central Valley Water Board to delay monitoring until January/February 2016 and, if necessary, modify the sampling stations (J. Cooke, personal communication, to P. Bedore on March 2, 2015). While these actions may produce additional data to more adequately address the objectives and hypotheses of the Control Study, the Port's methylmercury load estimates are sufficient to show that the Port's BMPs are effective at maintaining methylmercury loads below applicable WLAs (Table 1). The Port has identified alternate sampling sites that may be used, if necessary, to continue the Methylmercury Control Study in 2016.

Table 1. Summary of Contents of Upstream and Downstream Storm Drains at each of the Study Sites during 2014 and 2015.

Year	Monitoring Date	Site A		Site B	
		Upstream	Downstream	Upstream	Downstream
2014	March 13, 2014	Water - Present Sediment - None	Water - Present Sediment - None	Water - Present Sediment - None	Water - Present Sediment - None
	May 22, 2014	Water - Present Sediment - None	Water - Present Sediment - None	Water - Present Sediment - Negligible	Water - Present Sediment - Little
	August 20, 2014	Water - Present Sediment - None	Water - Present Sediment - None	Water - None Sediment - Negligible	Water - Present Sediment - Negligible
2015	February 26, 2015	Water - Present Sediment - None	Water - Present Sediment - None	Water - Present Sediment - None	Water - Present Sediment - None

Conclusion

The Port's Methylmercury Control Study was initiated in 2014, soon after the Work Plan was approved by the Central Valley Water Board on February 14, 2014. The Control Study is designed to provide targeted information on the effect of storm drain maintenance on methylmercury generation in sediment and water that accumulates in storm drain catch basins. However, the Control Study's storm drain monitoring sites did not accumulate sediment during 2014 and 2015 as expected because of critically dry hydrologic conditions and because of less intense sediment-generating activities occurring near the storm drains relative to the past. The Control Study will continue in 2016 using alternative monitoring sites, as necessary. While additional data may be useful in addressing the objectives and hypotheses of the Control Study, the Port's current methylmercury load estimates show that the Port's BMPs are effective at maintaining methylmercury loads below applicable WLAs.